

State of the art

The invention refers to an electropneumal brake system after the genus of the principal claim. A such brake system is known (DE-OS 36 17 356).

With this known brake system the work of single valves monitored, a comprising Funktionskontrolle, becomes which works automatic, is however not possible.

Advantages of the invention

The Bremsystem initially specified with the characterizing features of the principal claim has in contrast to this the advantage that a Funktionskontrolle runs off by self examination of the system, without the driver or the workshop direct engage must. The examination is to become by conventional sensors performed, which are light available and more replaceable.

An other advantage is given by the fact that corresponding test programs are put downable as software in the electronic control unit, so that them from there at any time retrieved to become to be able.

Drawing

An embodiment of the invention is in the drawing shown and in the subsequent description more near explained.

Description of the embodiment

A commercial vehicle brake system has an electropneumal brake value giver 1, that with a desired value being 1' equipped is and with that, vehicle brake cylinder of 2, 3, 4, 5 valves 6, 7, 8 and 9, 10, 11, 12 pneumatic supplying with braking pressure and/or. electrical are controllable. Pressure sensors 13, 14, 15, 16 are assigned to the brake cylinders 2, 3, 4, 5. In addition those are the brake cylinders 2, 3, 4, 5 associated vehicle wheels with number of revolutions sensors 17, 18, 19, 20 equipped.

For the compressed air supply of the system a compressor 21, from a vehicle engine 22 over a fixed translation, serves that e.g. over a V belt driven becomes. The vehicle engine 22 has a tachometer 23 and Kühlwasser-Thermostaten 24.

From the compressor 21 the compressed air arrives over a pressure regulator 25 and a four-circle protection valve 26 into three reservoirs 27, 28, 29, two for the towing vehicle and one for a trailer brake. Likewise a pressure sensor 30, 31, 32 is assigned to each reservoir 27, 28, 29.

All sensors 13, 14, 15, 16 and 30, 31, 32 as well as the brake value giver 1, the number of revolutions sensors 17, 18, 19, 20 and 23 and the Kühlwasser-Thermostat are 33 connected over electrical line connections to an electronic control unit; these line connections are for clarity of the drawing only with in each case a dash (stub) at respective sensor the shown.

The control unit 33 is by means of multi-pole cables 34 with an indication 35 at the dashboard of the vehicle connected, and there is there also a warning lamp 36, which is likewise 33 connected to the control unit. Finally still another outside temperature thermometer 37 and a hygrometer 38 with terminal to the control unit 33 are in the cab of the vehicle.

Impact

With the operation of the vehicle all sensors 13, 14, 15, 16 and 30, 31, 32, as well as 23 and 24 and the desired value being 1 supply' at the brake value giver 1 measurement values to the electronic control unit 33. On the indication 35 in the cab the driver can read off among other things the current supply pressures, the operating temperature of the engine and its speed. A warning can become the driver over the indication 35 or over the extra warning lamp 36 or eventual also akustisch too part.

Beside the cooling water temperature the ambient temperature is 33 known by the thermometer 37 and the humidity by the hygrometer 38 the electronic control unit.

By signal logic in the control unit 33 and eventual calculations in the control unit 33 or other 33 vehicle and/or brake assembly parameter stored in the control unit can be accomplished now the subsequent examinations:

I. Capacity of the compressor 9

Dependent one of the engine speed and the operating temperature becomes the pressure increase over the time in the reservoirs 27, 28, 29 by the control unit 33 observed. With exceeding of an upper limit value for the filling time as well as when falling below a lower limit value a warning becomes given to the driver.

II. Switching-off pressure of the pressure regulator 25

If the switching-off pressure of the pressure regulator 25 programmed in the control unit 33 is exceeded by a certain tolerance, a warning becomes outputted to the driver.

III. air consumption per braking

Dependent one of the installed brake cylinder volumes, which are to be programmed 33 into the control unit, and dependent of the pressure in the brake cylinders 2, 3, 4 and 5 with brakes, which is 33 known by the desired value being 1' and/or the pressure sensors 13, 14, 15, 16 the control unit, develops in the reservoirs 27, 28 a pressure drop, which becomes 31 detected of the pressure sensors 30 and. With these values air consumption per braking is to be determined.

With new brake linings and/or. new set linkage plates the pressure drop per braking will be smaller. With increased lining wear the pressure drop will increase with same brake pressure desired value (larger volume in

the brake cylinders). With automatic linkage plate the pressure drop will become again smaller after resetting by the linkage plate, so that a type course like saw teeth of the pressure drop results here over the time.

There each braking with another brake pressure desired value made, must this of the control unit 33 e.g. by the calculation of a "normalized pressure drop" considered become (or selection of brakings with approximately same pressure). The pressure drop a certain exceeds, programmed limit value in the control unit 33 (this limit value can also from the decrease of pressure values after start-up of the brake system (new condition) derived become) or

if the linkage plate has a predetermined number of recoveries performed (payment of the saw teeth in the SG), the driver receives a warning because of excessive Belagverschleiss and/or. Water in the reservoirs 27 and 28.
iv. tightness of the plant

a) Supply side of the brake system

If braked (information lies in the control unit 33 over the desired value being 1 " forwards) does not become, the supply pressure (measured with the pressure sensors 30 and 31) per unit time may drop only around a predetermined, programmed value. Otherwise the indication becomes 35 or 36 activated. This applies in particular, if the engine stands (no additional charge, info. over number of revolutions sensor 23). With brakings and current engine the examination steps as per. I in function, in order to supervise the additional charge.

b) Transmission means to including brake cylinders

A too high air consumption per braking can be to due also to leakages.

Around certainty over the cause to obtained, the subsequent examination can become performed:

Prerequisite: Vehicle stands (information over wheel number of revolutions sensors 17, 18, 19, 20)

Engine 22 stands (information over engine speed sensor 23).

By the electronic control unit 33 a partial brake pressure becomes, e.g. 3 bar of in-controlled and a certain time held (valves 6, 7, 8 and 10, 11, 12 in Haltestellung, no pressure adjustment).

During this time the pressure in the brake cylinders 2, 3, 4, 5, measured with the pressure sensors 13, 14, 15, may drop 16, not a bottom predetermined value. Otherwise made warning to the driver.

This test cycle can e.g. from the driver by a switch initiated become, or by an input over a controller diagnose interface.

An automatic release of the test cycle in certain time intervals is likewise more conceivable. Case of the drivers before flow of the Prüfzeit the engine 22 again (signal of 23), becomes the test cycle automatic aborted starts.

In each case the checked controller 33 before Ingangsetzen of the test cycle whether the prerequisites are vehicle and engine stop satisfied.

Because all brake cylinders are 2, 3, 4, 5 16 equipped with pressure sensors 13, 14, 15, also a targeted error expenditure is possible, at which axle and/or. at which wheel the pressure drops.

A determination brake assembly and the trailer brake can be included likewise also into the examinations.

It is clearer that all sensors and signal transmitter are commercial and already also einzeln or also in subsets in commercial vehicles as well as an electronic controlled brake system and eventual electronic engine control used become. It does not belong also to the invention that appropriate signals over an electronic interface e.g. CAN to be controlled know.

According to the present invention is however a self-check of the entire electropneumatical brake system possible.

By software related linkages in the control unit 33 all examinations mentioned at smallest auxiliary expenditure performed can become. It is understandable that increased thereby the safety in driving and the error tracing in the workshop facilitated become.

1. Electropneumatical brake system for commercial vehicles with electrical default of the brake pressure desired value of an foot-operated brake value giver and with an electronic control unit as measured value input, computing centre and control pulse delivery, characterised in that at the members of the brake system, the

engine and the vehicle wheels sensors (13, 14, 15, 16, 30, 31, 32) and signal transmitters (17, 18, 19, 20, 23, 24, 37, 38) arranged are and that all sensors and signal transmitter are connected to the electronic control unit (33) for examination on intact of the brake system.

2. Elektro-pneumatisches brake system according to claim 1, characterised in that into the electronic control unit (33) also over outer thermometer (37) and hygrometer (38) from the environment taken measurement values, like temperature and air humidity o.dgl. ready for input, in it storable and by it are evaluable.

3. Elektro-pneumatisches brake system for Nutzfahrzeuge according to claim 1, characterised in that dependent of the signals of the sensor (tachometer 23) of the vehicle engine (22) and of those of the cooling water sensor (cooling water thermometer 24) by means of the sensors mounted at the reservoirs (27, 28, 29) (pressure switch 30, 31, 32) the pressure increase over the time is more measurable and that during a Überschreitung or a falling below of limit values for the filling time reservoir (27, 28, 29) is capable of being output by means of the electronic control unit (33) a warning to the driver.

4. Elektro-pneumatisches brake system for commercial vehicles according to claim 3, characterised in that the switching-off pressure of the pressure regulator (25) into the electronic control unit (33) is programmed and that during excess of a limit value for the switching-off pressure by means of the electronic control unit (33) a warning is capable of being output to the driver.

5. Elektro-pneumatisches brake system for commercial vehicles according to claim 1, characterised in that the work volumes of the brake cylinders (2, 3, 4, 5) into the electronic control unit (33) are programmed and that with the help of the pressure sensors (30, 31, 32) and the desired value of the brake value giver potentiometer (1') with brakes by brake lining wear, with use of an automatic adjusting device eventual longitudinal also like saw teeth, increased pressure drop in the reservoirs (27, 28, 29) is communicable more detectable and the control unit (33) and that with exceeding of a limit value by means of the electronic control unit (33) a warning is capable of being output to the driver.

6. Elektro-pneumatisches brake system for commercial vehicles according to claim 1, characterised in that by means of the signals of the supply pressure sensors (pressure switches 30, 31, 32) and a negative signal of the brake value giver desired value potentiometer (1') with not operated brake a pressure drop is more detectable and that by the electronic control unit (33) on falling below a limit value of the pressure drop a warning is capable of being output to the driver.

7. Elektro-pneumatisches brake system for commercial vehicles according to claim 1, characterised in that by means of the signals of the wheel number of revolutions signal transmitters (17, 18, 19, 20) and the sensor (tachometer (23) of the engine (22) with standing vehicle and/or with standing engine (22) of the electronic control unit (33) for a predetermined time a partial brake pressure once yourable and a certain time it is more durable and by means of the pressure sensors (13, 14, 15, 16) a pressure drop is more measurable and that on falling below a limit value by means of the electronic control unit (33) a warning is capable of being output to the driver.

8. Electropneumatisches brake system according to claim 7, characterised in that of the test cycle of the driver by means of an electric switch is introducable.

9. Electropneumatisches brake system according to claim 7, characterised in that of the test cycle automatic after certain time intervals of the electronic control unit (33) is introducable.

10. Electropneumatisches brake system according to claim 9 to interrupt characterised in that of the automatic starting test cycle by a signal of the sensor (tachometer 23) of the engine (22) is.

11. Electropneumatisches brake system according to claim 9 or 10, characterised in that with the electronic control unit (33) by means of signals of the wheel number of revolutions signal transmitters (17, 18, 19, 20) and the sensor (tachometer 23) of the engine (22) before approach of the test cycle the vehicle and the engine stop is more detectable.